Management of Acute Stroke

Hyperacute Management

Brain imaging

Acute ischaemic stroke

Intracerebral haemorrhage (ICH)

Physiological Support

Hypertension

Hypotension

Fever

Glucose

Oxygen

Cardiac arrhythmia

Fluids and electrolytes

Prevention and Management of Complications

Swallowing

Nutrition

Venous thromboembolism

Urinary catheters

Pressure areas

Cerebral oedema

Hydrocephalus

Seizures

Agitation

Early Secondary Prevention

Antiplatelet therapy

Therapeutic anticoagulation

Blood pressure

Lipids

Carotid stenosis

Lifestyle modifications

Early rehabilitation

References

Management of Acute Stroke

Stroke is a medical emergency and there should be no delay in access to treatment.

All patients with suspected stroke should be assessed in the Cardiac and Stroke Receiving Unit (CSRU) at Wycombe Hospital. The stroke nurse on duty (SNOD) should be made aware of all patients with suspected stroke and all such patients should be clerked using the Acute Stroke Admission Pathway (Guidelines 149A and 149B).

Patients presenting to Stoke Mandeville Hospital with suspected stroke should be discussed with the stroke team at Wycombe Hospital as soon as possible to decide on the most appropriate management. This should be with the SNOD in the first instance. Patients within the time window for thrombolysis should be transferred to Wycombe CSRU as a time critical transfer. See Guideline 274 Stroke Patients presenting to Stoke Mandeville Accident and Emergency Department.

Patients with TIA should be managed according to Guideline 759 TIA Risk Assessment and Referral Form. These cases should be discussed with the SNOD as appropriate.
Important contacts for the stroke team

<table>
<thead>
<tr>
<th>Role / Location</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke nurse on duty (SNOD)</td>
<td>Mobile: 07795 591295; Bleep 3730</td>
</tr>
<tr>
<td>CSRU</td>
<td>Extension 5443 (Wycombe)</td>
</tr>
<tr>
<td>Hyperacute Stroke Unit (HASU, Ward 8)</td>
<td>Extension 5217 or 5957 (Wycombe)</td>
</tr>
<tr>
<td>Stroke registrar (9am - 5pm, Monday - Friday)</td>
<td>Bleep 3001/3002</td>
</tr>
<tr>
<td>Medical registrar on-call at Wycombe (for out of hours)</td>
<td>Bleep 9112</td>
</tr>
<tr>
<td>Medical SHO on-call at Wycombe</td>
<td>Bleep 9112</td>
</tr>
<tr>
<td>Stroke physician on-call (SPOC)</td>
<td>Available via switchboard</td>
</tr>
</tbody>
</table>

The management of acute stroke is divided into the following areas:
1) Hyperacute management including stroke thrombolysis.
2) Physiological support in the first 24 - 48 hours (salvage of peri-infarct tissue at risk of infarction: the ischaemic penumbra).
3) Prevention and management of complications (medical or neurological).
4) Early secondary prevention.
5) Early rehabilitation.

**Hyperacute Management**

Any person with acute onset neurological symptoms and signs needs rapid diagnosis to differentiate between acute cerebrovascular cause and others, such as hypoglycaemia or head injury (see Guideline 145 Evaluation and Investigation of Acute Stroke).

All patients should be transferred to the Hyperacute Stroke Unit (HASU) once assessed and stabilised, unless there are extenuating circumstances and the case has been discussed with the SPOC.

**Brain imaging**

Should be performed immediately (ideally next slot or within one hour) in the following cases:
- Indication for thrombolysis (will need an immediate scan) or early anticoagulation.
- On anticoagulant therapy (warfarin or new oral anticoagulants such as dabigatran).
- Known bleeding tendency.
- Depressed level of consciousness (GCS <13).
- Unexplained fluctuating neurological symptoms.
- Papilloedema, neck stiffness or fever.
- Severe headache at onset of symptoms.

All people with acute stroke should have brain imaging within 12 hours of admission (RCP Guidelines, 2012).

Brain imaging is necessary to delineate the type of vascular event, as the management is dependent on the aetiology.

**Acute ischaemic stroke**

Consideration should be made for acute thrombolytic therapy.

THROMBOLYSIS (see also Guideline 149A Acute Stroke Admission Pathway for inclusion/exclusion criteria, dosage and monitoring guidelines).
- Thrombolysis if given within **4.5 hours** of acute ischaemic stroke improves outcome.
- All patients admitted within 4.5 hours of stroke onset or with in-hospital stroke, should be referred immediately to the SNOD before arranging any investigations.
- The stroke nurse will organise urgent brain imaging, CT or MRI and inform the SPOC.
- After brain imaging the stroke physician will advise to start alteplase, if appropriate.
• Check blood glucose, insert an IV line and perform an ECG after contacting the stroke nurse.
• Out of working hours the stroke physician will be available to review the patient via telemedicine. The medical registrar on-call should assess the patient and assist the stroke physician in the neurological assessment.
• The medical registrar will be expected to do the NIHSS scoring and record it in the patient notes.
• If there is suspected intracranial haemorrhage (ICH) during/after thrombolysis (reduced GCS, persistent vomiting, headache, new neurological features), stop alteplase infusion and assess patient. Inform SPOC and organise for urgent CT scan, FBC, APTT, INR, fibrinogen level and cross-match.
• If there is major haemorrhage elsewhere (e.g. GI tract), stop alteplase infusion and assess patient. Inform SPOC and organise for urgent FBC, APTT, INR and cross-match. Consider cryoprecipitate 6 - 8 units and discuss with haematologist.

Any patient, regardless of age or stroke severity, where treatment can be started within 4.5 hours of known symptom onset and who has been shown not to have an intracerebral haemorrhage or other contraindications, should be considered for treatment using alteplase.

**Intracerebral haemorrhage (ICH)**

• Anticoagulation with warfarin should be reversed immediately using both prothrombin complex concentrate and intravenous vitamin K (discuss with haematologist).
• Direct thrombin or factor Xa inhibitors have no antidote so discuss with a haematologist. See also [Guideline 34FM Dabigatran Guidance for Management of Overdose, Bleeding and Emergency/Elective Surgery](#).

• Systolic blood pressure should be lowered to 140 mmHg in patients with intracerebral haemorrhage (ICH) who do not have clinical or radiological evidence of raised intracranial pressure (see [Guideline 150 Blood Pressure Management in Acute Intracerebral Haemorrhage](#)). Other patients should have their systolic blood pressure lowered to 180 mmHg if over this level.

• Patients with intracerebral haemorrhage should be monitored in the HASU and should be referred for immediate brain imaging if there is any change in level of consciousness.

• A neurosurgical opinion should be obtained if there is any doubt as to whether the patient may be a candidate for neurosurgical intervention. Indications for neurosurgery include patients with:
  
o Posterior fossa intracerebral haemorrhage (especially cerebellar bleeds).
  
o Primary intracerebral haemorrhage who have hydrocephalus.
  
o An intracerebral haemorrhage who are deteriorating clinically and where the haematoma is within 1 cm of the skull vault.
  
o Intracerebral haemorrhage secondary to a cerebral aneurysm.

**Physiological Support**

There is very strong evidence that Stroke Unit care reduces mortality and morbidity in patients with acute stroke. Patients suspected of having acute stroke should be transferred to the HASU within 4 hours of their admission to the CSRU.

**Hypertension**

In general, any pre-existing antihypertensive medication should continue to be given, assuming the patient can swallow and take their medication. If the patient is unable to swallow, consult the ward pharmacist for advice.

Antihypertensive treatment in acute stroke is recommended if there is one or more of the following:

• Hypertensive encephalopathy.
• Hypertensive nephropathy.
• Hypertensive cardiac failure.
• Aortic dissection.
• Pre-eclampsia/eclampsia.
• Intracerebral haemorrhage with systolic blood pressure over 180 mmHg (see above).

Acutely elevated BP is common following ischaemic stroke and should not be treated aggressively. In patients with a systolic BP >220 mmHg, or a diastolic BP >110 mmHg, blood pressure should be reduced gradually.

Candidates for intravenous thrombolysis should be considered for blood pressure reduction if blood pressure is above 185/110 mmHg. This can be achieved using intravenous labetalol.

If using labetalol intravenously, give 10 - 20 mg over 1 - 2 minutes. An alternative is intravenous glyceryl trinitrate infusion 0.5 - 10 mg per hour. For oral therapy consider ramipril 2.5 mg or amlodipine 5 mg.

**Hypotension**

If the blood pressure is below 140 mmHg systolic then omit normal antihypertensives and correct hypovolaemia with intravenous sodium chloride 0.9%. Consider a cause of hypotension, e.g. cardiac ischaemia, arrhythmia or sepsis.

**Fever**

Treat hyperthermia (temperature >37.5°C) with paracetamol (1 g four times daily PO/IV) and cooling (fans, sponging).

Identify and treat any infection following the guidelines given on the Antimicrobial Sector of RxGuidelines (see https://viewer.rx-guidelines.com/bucks).

**Glucose**

If the blood glucose remains >10 mmol/L, consider starting an insulin sliding scale, as high blood glucose can worsen the ischaemic damage.

**Oxygen**

Give oxygen (24%) to patients with O₂ saturations persistently below 95%.

**Cardiac arrhythmia**

All patients should have continuous cardiac monitoring for the first 48 hours on the HASU.

**Fluids and electrolytes**

Correct hypovolaemia and then give maintenance fluids. Almost all acute stroke patients need intravenous fluid therapy. Consider using intravenous sodium chloride 0.9% for fluid replacement. Avoid glucose if possible (unless hyperosmolar, hypoglycaemic or on an insulin sliding scale).

**Prevention and Management of Complications**

Much of the mortality and morbidity following stroke is from secondary complications.

**Swallowing**

All patients with acute stroke should be screened for a swallowing disorder before being given oral food/fluids. This should be done by a person with specific training in swallowing disorders using the pathway in Guideline 149A Acute Stroke Admission Pathway.

**Nutrition**

All patients should be screened for malnutrition using the Malnutrition Universal Screening Tool (MUST). Consideration should be made for a nasogastric tube within the first 24 hours if the patient is not eating orally.
Venous thromboembolism

First line thromboembolism prophylaxis in patients with acute stroke is with intermittent pneumatic compression (IPC) boots - see Mandatory Risk Assessment for Venous Thromboembolism (VTE) for Stroke ICP (Guidelines 765 and 733FM, Appendix 5.2).

DVT prophylaxis using heparin or graduated support stockings should NOT be used routinely.

Urinary catheters

Catheters should be avoided where possible. Incontinence is not an appropriate indication for urinary catheterisation. Appropriate indications for urinary catheterisation are:

- Urinary retention.
- Need for accurate fluid balance.
- Sacral pressure area.
- Dignity in end of life care.

Pressure areas

Pressure areas should be prevented by risk assessment (e.g. Waterlow), pressure-relieving mattresses where appropriate, regular inspection and attention to nutrition.

Cerebral oedema

This tends to peak at 3 - 5 days after cerebral infarction.

Patients with space-occupying cerebellar infarction and reduced conscious level should be discussed with neurosurgery for consideration of urgent decompressive surgery.

In selected patients with space-occupying supra-tentorial infarction (malignant middle cerebral artery syndrome), consider referral for urgent hemicraniectomy (surgical decompression). This should be done after discussion with the SPOC. Suitable patients will be relatively young, have large MCA territory strokes and have drowsiness. Referrals are made in the first instance to the John Radcliffe Stroke Unit on-call team. If suitable, patients are transferred to the Stroke Unit at the John Radcliffe (ward 5B) where they will be reviewed by the neurosurgeons. Referrals should be made within 24 hours of stroke onset and surgery should occur within 48 hours of stroke onset.

Hydrocephalus

Consider if there is neurological deterioration, especially if there has been intraventricular haemorrhage or if there has been posterior fossa stroke (e.g. cerebellar bleed or infarction). Urgent ventriculostomy may be required.

Seizures

Common especially after cerebral haemorrhage. Consider in any deterioration and treat conventionally, e.g. with diazepam 10 mg IV or lorazepam 4 mg IV, followed by a phenytoin infusion. Phenytoin should be given as an infusion of 20 mg/kg at a rate not exceeding 50 mg/minute. A maintenance dose of 100 mg six to eight hourly orally or intravenously is then given. Prepare the initial infusion using the Buckinghamshire Healthcare NHS Trust Injectables Guide. See also Guideline 73 Phenytoin Information for Prescribing, Monitoring and Administration in Adults.
Agitation
Consider urinary retention or other sources of pain and manage appropriately. If necessary, use short acting benzodiazepines in the first instance (e.g. midazolam 2.5 mg by subcutaneous injection).

Causes of neurological deterioration after stroke
Carotid stenosis with recurrent embolisation.
Carotid stenosis with low-flow (possibly with hypotension).
Recurrence cardioembolism.
Seizure (especially after haemorrhage).
Sepsis/hypoglycaemia/hypoxia/hypotension (e.g. arrhythmia).
Cerebral oedema (peaks at day 3 - 5 after infarction).
Haemorrhagic conversion of infarction.
Evolving lacunar infarction (capsular warning syndrome).
Hydrocephalus (ICH with intraventricular blood, posterior fossa bleed/infarct).
Expanding haematoma or rupture into ventricle.

Early Secondary Prevention
All patients should have appropriate investigation to determine the cause of the stroke (see Guideline 145 Evaluation and Investigation of Acute Stroke).

Antiplatelet therapy
- Antiplatelet therapy should be given to all patients with acute ischaemic stroke and in whom brain imaging has excluded an intracerebral haemorrhage.
- An initial aspirin dose of 300 mg (given orally or rectally) is followed by a daily dose of 300 mg orally for 2 weeks. After 2 weeks, aspirin is stopped and clopidogrel 75 mg PO daily is prescribed long term for secondary prevention.
- In certain clinical situations (crescendo TIA, significant carotid stenosis causing recurrent symptoms, capsular warning syndrome), patients can be given oral aspirin (75 mg after loading with 300 mg) and oral clopidogrel (75 mg after loading with 300 mg) for 4 to 6 weeks. This should only be done after discussion with the SPOC.
- Patients who are intolerant to clopidogrel should be given aspirin 75 mg daily and dipyridamole MR 200 mg PO twice daily.
- Patients receiving dipyridamole should be warned that they may experience severe headache or GI upset, in which case they may have to discontinue the medication.
- In patients who are thrombolysed with alteplase, aspirin is contraindicated in the first 24 hours even if the initial brain imaging did not show any haemorrhage. These patients should have a repeat brain imaging at 24 hours (+/- 8 hours). The repeat brain imaging should be routinely reviewed with the stroke physician prior to starting aspirin.

Therapeutic anticoagulation
- In patients with ischaemic stroke who have atrial fibrillation or other cardioembolic source, anticoagulation should be delayed for 10 - 14 days if the stroke is large. The patient should receive aspirin 300 mg daily during this period. If the stroke is small, anticoagulation can be started sooner. The decision to start anticoagulation earlier than 14 days should be taken only by the stroke physician responsible for the patient.
- All patients with atrial fibrillation who are being started on anticoagulation should have a referral form faxed to the New Oral Anticoagulant Clinic (NOAC) on fax number 01494 425011 (see Appendix C in Guideline 313FM Dabigatran, Rivaroxaban and Apixaban for Atrial Fibrillation).
- If the Oral Anticoagulation Decision Unit recommends a new oral anticoagulant (dabigatran, rivoroxaban, apixaban) then antiplatelet agents should be stopped at the start of
anticoagulation in most cases, unless the patient requires long term treatment with both anticoagulation and antiplatelet treatment.

- Treatment with fractionated or unfractionated heparin should be reserved for highly selected cases and should be undertaken only after discussion with the SPOC. There is a significant risk of haemorrhagic conversion of cerebral infarction with the use of therapeutic doses of heparin or low molecular weight heparin.

**Blood pressure**

Blood pressure reduction after stroke prevents further vascular events. Treatment should be initiated or increased to achieve a blood pressure below 130/80 except in severe bilateral carotid stenosis when the target is 130 - 150 systolic.

The blood pressure often falls spontaneously over the first few days after stroke, so blood pressure lowering therapy for long term secondary prevention should be initiated at hospital discharge or at 1 - 2 weeks, whichever is later.

If target BP not achieved, refer to specialist.

Agent of choice:

- Over 55 years or AfroCaribbean of any age:
  Long acting dihydropiridine calcium channel blocker (e.g. amlodipine) or, if not tolerated or there is evidence of (or a high risk of) heart failure, give a thiazide diuretic, e.g. indapamide. If not achieved add ACE-I (e.g. ramipril) or ARB (e.g. candesartan)

- Under 55 years
  ACE-I or ARB
  See Guideline 227FM Management of Hypertension in Adults.

**Lipids**

All patients with non-cardioembolic ischaemic stroke or TIA should be offered treatment with a statin unless contraindicated. Patients with cardioembolic stroke may be offered a statin, particularly if there is evidence of atherosclerosis – see Guideline 104FM Statins and Ezetimibe for the Primary and Secondary Prevention of Cardiovascular Disease for recommendations on which statin to use.

Statin therapy should not be given routinely in primary intracerebral haemorrhage, as there is an association between statin use and cerebral haemorrhage. Statins may nevertheless be appropriate if the risk of vascular events due to atherosclerosis is very high.

**Carotid stenosis**

Any patient with a carotid artery territory TIA or stroke without severe disability should be considered for endarterectomy.

Carotid imaging should be organised, either MRA, duplex scan or CTA.

Endarterectomy should be considered in symptomatic stenosis of 50 – 99% using the NASCET criteria (symptomatic stenosis 70 – 99% using ECST criteria).

Surgery should be performed within two weeks of symptoms and preferably within one week.

**Lifestyle modifications**

- Advise to stop smoking and support with formal smoking cessation programme.
- Advise to take regular exercise.
- Eat an optimum diet.
- Reduce saturated fats.
- Reduce salt intake.
- Alcohol should be kept within recognised safe drinking limits.
Early rehabilitation

Early sitting out and mobilisation help to reduce the incidence of stasis pneumonia, venous thromboembolism and pressure ulceration. They should occur as soon as possible after admission providing the patient is stable. Some patients suffer neurological deterioration when placed in an upright position early after stroke and appropriate monitoring is necessary.

Once stable, outcomes are improved if patients receive as much rehabilitation as tolerated.

References


See also:
Guideline 34FM Dabigatran: Guidance for Management of Overdose, Bleeding and Emergency/Elective Surgery
Guideline 73 Phenytoin Information for Prescribing, Monitoring and Administration in Adults*
Guideline 104FM Statins and Ezetimibe for the Primary and Secondary Prevention of Cardiovascular Disease
Guideline 145 Evaluation and Investigation of Acute Stroke*
Guideline 149A Acute Stroke Pathway – Part 1*
Guideline 149B Acute Stroke Pathway – Part 2*
Guideline 150 Blood Pressure Management in Acute Intracerebral Haemorrhage*
Guideline 222 Injectables Policy and Guide (Adults)*
Guideline 227FM Clinical Management of Hypertension in Adults
Guideline 274 Stroke Patients Presenting to Stoke Mandeville Accident and Emergency Department*
Guideline 313FM Dabigatran, Rivaroxaban and Apixaban for Atrial Fibrillation
Guideline 708FM Antiplatelets for the Secondary Prevention of Occlusive Vascular Events
Guideline 733FM Thromboprophylaxis in Adults
Guideline 759 TIA Risk Assessment and Referral Form*
Guideline 765 Venous Thromboembolism Risk Assessment - Stroke*
*BHT users only